

DV Qualifiers
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2/3/17

CERTIFICATION

SDG No: MC49177 Laboratory: Accutest, Massachusetts
Site: BMS, Building 5 Area, PR Matrix: Groundwater
Humacao, PR

SUMMARY: Groundwater samples (Table 1) were collected on the BMSMC facility – Building 5 Area. The BMSMC facility is located in Humacao, PR. Samples were collected December 13 - 15, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC49177. Results were validated using the following quality control criteria of the methods employed (MADEP VPH and MAPED EPH, Massachusetts Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC49177-1	G-IR3	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-2	EB121416	AQ – Equipment Blank	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-3	MW-21S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-3D	MW-21S MSD	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-3S	MW-21S MS	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-4	FB121316	Field Blank Water	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-5	S-43S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-6	S-42S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-7	E-1R	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-8	D-1R	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-9	D-1R DUP	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-10	MW-13	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-11	MW-7	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC49177-12	FB121416	Field Blank Water	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-13	MW-22S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49177-14	EB121516	AQ – Equipment Blank	Volatiles TPHC Ranges Extractable TPHC Ranges

Reviewer Name: Rafael Infante
Chemist License 1888

Signature: Rafael Infante

Date: January 21, 2017



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Report of Analysis

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Client Sample ID:	G-1R3	Date Sampled:	12/13/16
Lab Sample ID:	MC49177-1	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78373.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2	WX78374.D	100	12/20/16	AF	n/a	n/a	GWX3883

Run #	Purge Volume
Run #1	5.0 ml
Run #2	5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	161	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	85000 ^a	5000	800	ug/l	
	C9- C10 Aromatics (Unadj.)	151	50	9.7	ug/l	
	C5- C8 Aliphatics	85.5	50	8.8	ug/l	
	C9- C12 Aliphatics	17800	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	95%	83%	70-130%
	2,3,4-Trifluorotoluene	105%	92%	70-130%

(a) Result is from Run# 2



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: G-1R3
 Lab Sample ID: MC49177-1
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/13/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16551.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16579.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	930 ml	2.0 ml
Run #2	930 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	49.8	110	31	ug/l	J
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	71.8	110	29	ug/l	J
	C11-C22 Aromatics	48.8	110	31	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	80%	63%	40-140%
321-60-8	2-Fluorobiphenyl	99%	79%	40-140%
3386-33-2	1-Chlorooctadecane	35% ^b	33% ^b	40-140%
580-13-2	2-Bromonaphthalene	101%	80%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: EB121416
 Lab Sample ID: MC49177-2
 Matrix: AQ - Equipment Blank
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78387.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	10.1	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	14.5	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	81%		70-130%
	2,3,4-Trifluorotoluene	91%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: EB121416
 Lab Sample ID: MC49177-2
 Matrix: AQ - Equipment Blank
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16552.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16580.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	880 ml	2.0 ml
Run #2	880 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	33	ug/l	
	C9-C18 Aliphatics	ND	110	19	ug/l	
	C19-C36 Aliphatics	ND	110	31	ug/l	
	C11-C22 Aromatics	ND	110	33	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	87%	85%	40-140%
321-60-8	2-Fluorobiphenyl	108%	104%	40-140%
3386-33-2	1-Chlorooctadecane	32% ^b	33% ^b	40-140%
580-13-2	2-Bromonaphthalene	110%	105%	40-140%

(a) Confirmation run.

(b) Outside control limits .Sample results confirmed by re-fractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
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Client Sample ID: MW-21S
 Lab Sample ID: MC49177-3
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78369.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	12.8	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	14.8	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	85%		70-130%
	2,3,4-Trifluorotoluene	91%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: MW-21S
 Lab Sample ID: MC49177-3
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16553.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16581.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	950 ml	2.0 ml
Run #2	950 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	41.1	110	30	ug/l	J
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	40.4	110	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	77%	64%	40-140%
321-60-8	2-Fluorobiphenyl	97%	84%	40-140%
3386-33-2	1-Chlorooctadecane	26% ^b	29% ^b	40-140%
580-13-2	2-Bromonaphthalene	97%	85%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
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Client Sample ID: FB121316
 Lab Sample ID: MC49177-4
 Matrix: AQ - Field Blank Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/13/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78388.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	9.2	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	12.8	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	80%		70-130%
	2,3,4-Trifluorotoluene	93%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: FB121316
 Lab Sample ID: MC49177-4
 Matrix: AQ - Field Blank Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/13/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16554.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16582.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

Run #	Initial Volume	Final Volume
Run #1	900 ml	2.0 ml
Run #2	900 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	32	ug/l	
	C9-C18 Aliphatics	ND	110	19	ug/l	
	C19-C36 Aliphatics	ND	110	30	ug/l	
	C11-C22 Aromatics	ND	110	32	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	84%	70%	40-140%
321-60-8	2-Fluorobiphenyl	95%	81%	40-140%
3386-33-2	1-Chlorooctadecane	29% ^b	34% ^b	40-140%
580-13-2	2-Bromonaphthalene	96%	82%	40-140%

(a) Confirmation run.

(b) Outside control limits .Sample results confirmed by re-fractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
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 E = Indicates value exceeds calibration range

J = Indicates an estimated value
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 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-43S
 Lab Sample ID: MC49177-5
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/15/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78379.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	42.9	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	59.5	50	8.0	ug/l	B
	C9- C10 Aromatics (Unadj.)	29.7	50	9.7	ug/l	JB
	C5- C8 Aliphatics	31.4	50	8.8	ug/l	J
	C9- C12 Aliphatics	27.3	50	8.0	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	81%		70-130%
	2,3,4-Trifluorotoluene	94%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-43S
 Lab Sample ID: MC49177-5
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/15/16
 Date Received: 12/16/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16555.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16583.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	940 ml	2.0 ml
Run #2	940 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	80.6	110	30	ug/l	J
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	77.7	110	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	89%	82%	40-140%
321-60-8	2-Fluorobiphenyl	93%	88%	40-140%
3386-33-2	1-Chlorooctadecane	38% ^b	38% ^b	40-140%
580-13-2	2-Bromonaphthalene	95%	89%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
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 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-42S
 Lab Sample ID: MC49177-6
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/15/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78380.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	15.8	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	14.4	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	13.9	50	9.7	ug/l	JB
	C5- C8 Aliphatics	15.3	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	82%		70-130%
	2,3,4-Trifluorotoluene	94%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-42S
 Lab Sample ID: MC49177-6
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/15/16
 Date Received: 12/16/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16556.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16584.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	930 ml	2.0 ml
Run #2	930 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	57.3	110	31	ug/l	J
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	31.3	110	29	ug/l	J
	C11-C22 Aromatics	57.3	110	31	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	74%	69%	40-140%
321-60-8	2-Fluorobiphenyl	88%	84%	40-140%
3386-33-2	1-Chlorooctadecane	34% ^b	35% ^b	40-140%
580-13-2	2-Bromonaphthalene	89%	84%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
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Client Sample ID: E-1R
 Lab Sample ID: MC49177-7
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/13/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78381.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	23.6	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	17.9	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	13.1	50	9.7	ug/l	JB
	C5- C8 Aliphatics	14.5	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	81%		70-130%
	2,3,4-Trifluorotoluene	89%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	E-1R	Date Sampled:	12/13/16
Lab Sample ID:	MC49177-7	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16557.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16585.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

Run #	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2	980 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	98.2	100	29	ug/l	J
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	63.5	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	72%	77%	40-140%
321-60-8	2-Fluorobiphenyl	85%	94%	40-140%
3386-33-2	1-Chlorooctadecane	30% ^b	38% ^b	40-140%
580-13-2	2-Bromonaphthalene	86%	96%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: D-1R
 Lab Sample ID: MC49177-8
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/13/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78382.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	11.1	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	16.2	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	16.0	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	81%		70-130%
	2,3,4-Trifluorotoluene	92%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: D-1R
 Lab Sample ID: MC49177-8
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/13/16
 Date Received: 12/16/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16558.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16590.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2	980 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	36.6	100	29	ug/l	J
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	35.6	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	88%	69%	40-140%
321-60-8	2-Fluorobiphenyl	100%	80%	40-140%
3386-33-2	1-Chlorooctadecane	32% ^b	36% ^b	40-140%
580-13-2	2-Bromonaphthalene	102%	81%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	D-1R DUP	Date Sampled:	12/13/16
Lab Sample ID:	MC49177-9	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78383.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	50.2	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	13.8	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	15.2	50	9.7	ug/l	JB
	C5- C8 Aliphatics	45.5	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	82%		70-130%
	2,3,4-Trifluorotoluene	94%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	D-1R DUP	Date Sampled:	12/13/16
Lab Sample ID:	MC49177-9	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16559.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16591.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

Run #	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2	980 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	38.7	100	29	ug/l	J
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	37.7	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	80%	68%	40-140%
321-60-8	2-Fluorobiphenyl	97%	85%	40-140%
3386-33-2	1-Chlorooctadecane	34% ^b	27% ^b	40-140%
580-13-2	2-Bromonaphthalene	98%	86%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	MW-13	Date Sampled:	12/14/16
Lab Sample ID:	MC49177-10	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78384.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	10.4	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	13.4	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	80%		70-130%
	2,3,4-Trifluorotoluene	91%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: MW-13
 Lab Sample ID: MC49177-10
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16560.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2							

Run #	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	39.3	100	29	ug/l	J
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	38.9	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	93%		40-140%
321-60-8	2-Fluorobiphenyl	95%		40-140%
3386-33-2	1-Chlorooctadecane	41%		40-140%
580-13-2	2-Bromonaphthalene	97%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	MW-7	Date Sampled:	12/14/16
Lab Sample ID:	MC49177-11	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78385.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	12.1	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	18.4	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	18.5	50	9.7	ug/l	JB
	C5- C8 Aliphatics	11.8	50	8.8	ug/l	J
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	80%		70-130%
	2,3,4-Trifluorotoluene	93%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	MW-7	Date Sampled:	12/14/16
Lab Sample ID:	MC49177-11	Date Received:	12/16/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16562.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2							

Run #	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	72.5	100	29	ug/l	J
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	71.1	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	88%		40-140%
321-60-8	2-Fluorobiphenyl	84%		40-140%
3386-33-2	1-Chlorooctadecane	44%		40-140%
580-13-2	2-Bromonaphthalene	86%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: FB121416
 Lab Sample ID: MC49177-12
 Matrix: AQ - Field Blank Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78409.D	1	12/21/16	AF	n/a	n/a	GWX3884
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	9.7	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	11.6	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	84%		70-130%
	2,3,4-Trifluorotoluene	91%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: FB121416
 Lab Sample ID: MC49177-12
 Matrix: AQ - Field Blank Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16563.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2 ^a	DE16592.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2	920 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	31	ug/l	
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	31	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	91%	65%	40-140%
321-60-8	2-Fluorobiphenyl	102%	80%	40-140%
3386-33-2	1-Chlorooctadecane	31% ^b	37% ^b	40-140%
580-13-2	2-Bromonaphthalene	104%	81%	40-140%

(a) Confirmation run.

(b) Outside control limits .Sample results confirmed by re-fractionation/reanalysis.



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: MW-22S
 Lab Sample ID: MC49177-13
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78386.D	1	12/20/16	AF	n/a	n/a	GWX3883
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	10	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	14.2	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	81%		70-130%
	2,3,4-Trifluorotoluene	93%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: MW-22S
 Lab Sample ID: MC49177-13
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/14/16
 Date Received: 12/16/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16564.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
Run #2							

Run #	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	48.7	110	31	ug/l	J
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	48.0	110	31	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	94%		40-140%
321-60-8	2-Fluorobiphenyl	93%		40-140%
3386-33-2	1-Chlorooctadecane	42%		40-140%
580-13-2	2-Bromonaphthalene	94%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	EB121516	Date Sampled:	12/15/16
Lab Sample ID:	MC49177-14	Date Received:	12/16/16
Matrix:	AQ - Equipment Blank	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78410.D	1	12/21/16	AF	n/a	n/a	GWX3884
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	10.4	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	11.2	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	82%		70-130%
	2,3,4-Trifluorotoluene	93%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: EB121516
 Lab Sample ID: MC49177-14
 Matrix: AQ - Equipment Blank
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/15/16
 Date Received: 12/16/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16593.D	1	01/03/17	TA	12/27/16	OP49325	GDE925
Run #2							

	Initial Volume	Final Volume
Run #1	960 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	100	30	ug/l	
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	ND	100	30	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	83%		40-140%
321-60-8	2-Fluorobiphenyl	82%		40-140%
3386-33-2	1-Chlorooctadecane	56%		40-140%
580-13-2	2-Bromonaphthalene	84%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: MC49177

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC49177-3MS	WX78370.D	1	12/20/16	AF	n/a	n/a	GWX3883
MC49177-3MSD	WX78371.D	1	12/20/16	AF	n/a	n/a	GWX3883
MC49177-3	WX78369.D	1	12/20/16	AF	n/a	n/a	GWX3883

The QC reported here applies to the following samples:

Method: MADEP VPH REV 1.1

MC49177-1, MC49177-2, MC49177-3, MC49177-4, MC49177-5, MC49177-6, MC49177-7, MC49177-8, MC49177-9, MC49177-10, MC49177-11, MC49177-13

CAS No.	Compound	MC49177-3 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C5- C8 Aliphatics (Unadj.)	ND	300	355	119	300	350	117	1	70-130/25
	C9- C12 Aliphatics (Unadj.)	12.8	JB 450	457	111	450	445	108	3	70-130/25
	C9- C10 Aromatics (Unadj.)	14.8	JB 150	137	81	150	133	79	3	70-130/25

CAS No.	Surrogate Recoveries	MS	MSD	MC49177-3	Limits
	2,3,4-Trifluorotoluene	80%	80%	85%	70-130%
	2,3,4-Trifluorotoluene	88%	87%	91%	70-130%



* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: MC49177

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BMSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP49325-MS	DE16544.D	1	12/28/16	TA	12/27/16	OP49325	GDE923
OP49325-MSD	DE16545.D	1	12/28/16	TA	12/27/16	OP49325	GDE923
MC49177-3	DE16553.D	1	12/29/16	TA	12/27/16	OP49325	GDE924
MC49177-3 ^a	DE16581.D	1	01/03/17	TA	12/27/16	OP49325	GDE925

The QC reported here applies to the following samples:

Method: MADEP EPH REV 1.1

MC49177-1, MC49177-2, MC49177-3, MC49177-4, MC49177-5, MC49177-6, MC49177-7, MC49177-8, MC49177-9, MC49177-10, MC49177-11, MC49177-12, MC49177-13, MC49177-14

CAS No.	Compound	MC49177-3 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C11-C22 Aromatics (Unadj.)	41.1	J	870	88	851	726	80	11	40-140/25
	C9-C18 Aliphatics	ND		326	63	319	188	59	9	40-140/25
	C19-C36 Aliphatics	ND		435	92	426	375	88	7	40-140/25

CAS No.	Surrogate Recoveries	MS	MSD	MC49177-3	MC49177-3	Limits
84-15-1	o-Terphenyl	94%	88%	77%	64%	40-140%
321-60-8	2-Fluorobiphenyl	95%	99%	97%	84%	40-140%
3386-33-2	1-Chlorooctadecane	49%	46%	26%* ^b	29%* ^b	40-140%
580-13-2	2-Bromonaphthalene	97%	99%	97%	85%	40-140%

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



* = Outside of Control Limits.

MA

30 D'Angelo Dr. Building One, Marlborough, MA 01752
TEL 508-481-6200 FAX 508-481-7753
www.accutest.com

FED-EX Tracking # 777561610842
Account Order # MC49177
Account Job #

Client / Reporting Information		Project Information		Requested Analysis (see TEST CODE sheet)												Matrix Codes																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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H729	NOH730	NOH731	NOH732	NOH733	NOH734	NOH735	NOH736	NOH737	NOH738	NOH739	NOH740	NOH741	NOH742	NOH743	NOH744	NOH745	NOH746	NOH747	NOH748	NOH749	NOH750	NOH751	NOH752	NOH753	NOH754	NOH755	NOH756	NOH757	NOH758	NOH759	NOH760	NOH761	NOH762	NOH763	NOH764	NOH765	NOH766	NOH767	NOH768	NOH769	NOH770	NOH771	NOH772	NOH773	NOH774	NOH775	NOH776	NOH777	NOH778	NOH779	NOH780	NOH781	NOH782	NOH783	NOH784	NOH785	NOH786	NOH787	NOH788	NOH789	NOH790	NOH791	NOH792	NOH793	NOH794	NOH795	NOH796	NOH797	NOH798	NOH799	NOH800	NOH801	NOH802	NOH803	NOH804	NOH805	NOH806	NOH807	NOH808	NOH809	NOH810	NOH811	NOH812	NOH813	NOH814	NOH815	NOH816	NOH817	NOH818	NOH819	NOH820	NOH821	NOH822	NOH823	NOH824	NOH825	NOH826	NOH827	NOH828	NOH829	NOH830	NOH831	NOH832	NOH833	NOH834	NOH835	NOH836	NOH837	NOH838	NOH839	NOH840	NOH841	NOH842	NOH843	NOH844	NOH845	NOH846	NOH847	NOH848	NOH849	NOH850	NOH851	NOH852	NOH853	NOH854	NOH855	NOH856	NOH857	NOH858	NOH859	NOH860	NOH861	NOH862	NOH863	NOH864	NOH865	NOH866	NOH867	NOH868	NOH869	NOH870	NOH871	NOH872	NOH873	NOH874	NOH875	NOH876	NOH877	NOH878	NOH879	NOH880	NOH881	NOH882	NOH883	NOH884	NOH885	NOH886	NOH887	NOH888	NOH889	NOH890	NOH891	NOH892	NOH893	NOH894	NOH895	NOH896	NOH897	NOH898	NOH899	NOH900	NOH901	NOH902	NOH903	NOH904	NOH905	NOH906	NOH907	NOH908	NOH909	NOH910	NOH911	NOH912	NOH913	NOH914	NOH915	NOH916	NOH917	NOH918	NOH919	NOH920	NOH921	NOH922	NOH923	NOH924	NOH925	NOH926	NOH927	NOH928	NOH929	NOH930	NOH931	NOH932	NOH933	NOH934	NOH935	NOH936	NOH937	NOH938	NOH939	NOH940	NOH941	NOH942	NOH943	NOH944	NOH945	NOH946	NOH947	NOH948	NOH949	NOH950	NOH951	NOH952	NOH953	NOH954	NOH955	NOH956	NOH957	NOH958	NOH959	NOH960	NOH961	NOH962	NOH963	NOH964	NOH965	NOH966	NOH967	NOH968	NOH969	NOH970	NOH971	NOH972	NOH973	NOH974	NOH975	NOH976	NOH977	NOH978	NOH979	NOH980	NOH981	NOH982	NOH983	NOH984	NOH985	NOH986	NOH987	NOH988	NOH989	NOH990	NOH991	NOH992	NOH993	NOH994	NOH995	NOH996	NOH997	NOH998	NOH999	NOH1000

MA

30 D'Angelo Drive, Building One, Marlborough, MA 01752
TEL 508-481-4200 FAX 508-481-7753
www.accutest.com

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Order Control #

Adviser Job #

MC49177

Client / Reporting Information				Project Information				Requested Analysis (see TEST CODE sheet)												Matrix Codes																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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Sample #	Field ID / Point of Collection	MECH/ID Val #	Date	Time	Sampled by	Matrix	# of bottles	FO	ACH	ACHD	ACHD2	ACHD3	ACHD4	ACHD5	ACHD6	ACHD7	ACHD8	ACHD9	ACHD10	ACHD11	ACHD12	ACHD13	ACHD14	ACHD15	ACHD16	ACHD17	ACHD18	ACHD19	ACHD20	ACHD21	ACHD22	ACHD23	ACHD24	ACHD25	ACHD26	ACHD27	ACHD28	ACHD29	ACHD30	ACHD31	ACHD32	ACHD33	ACHD34	ACHD35	ACHD36	ACHD37	ACHD38	ACHD39	ACHD40	ACHD41	ACHD42	ACHD43	ACHD44	ACHD45	ACHD46	ACHD47	ACHD48	ACHD49	ACHD50	ACHD51	ACHD52	ACHD53	ACHD54	ACHD55	ACHD56	ACHD57	ACHD58	ACHD59	ACHD60	ACHD61	ACHD62	ACHD63	ACHD64	ACHD65	ACHD66	ACHD67	ACHD68	ACHD69	ACHD70	ACHD71	ACHD72	ACHD73	ACHD74	ACHD75	ACHD76	ACHD77	ACHD78	ACHD79	ACHD80	ACHD81	ACHD82	ACHD83	ACHD84	ACHD85	ACHD86	ACHD87	ACHD88	ACHD89	ACHD90	ACHD91	ACHD92	ACHD93	ACHD94	ACHD95	ACHD96	ACHD97	ACHD98	ACHD99	ACHD100	ACHD101	ACHD102	ACHD103	ACHD104	ACHD105	ACHD106	ACHD107	ACHD108	ACHD109	ACHD110	ACHD111	ACHD112	ACHD113	ACHD114	ACHD115	ACHD116	ACHD117	ACHD118	ACHD119	ACHD120	ACHD121	ACHD122	ACHD123	ACHD124	ACHD125	ACHD126	ACHD127	ACHD128	ACHD129	ACHD130	ACHD131	ACHD132	ACHD133	ACHD134	ACHD135	ACHD136	ACHD137	ACHD138	ACHD139	ACHD140	ACHD141	ACHD142	ACHD143	ACHD144	ACHD145	ACHD146	ACHD147	ACHD148	ACHD149	ACHD150	ACHD151	ACHD152	ACHD153	ACHD154	ACHD155	ACHD156	ACHD157	ACHD158	ACHD159	ACHD160	ACHD161	ACHD162	ACHD163	ACHD164	ACHD165	ACHD166	ACHD167	ACHD168	ACHD169	ACHD170	ACHD171	ACHD172	ACHD173	ACHD174	ACHD175	ACHD176	ACHD177	ACHD178	ACHD179	ACHD180	ACHD181	ACHD182	ACHD183	ACHD184	ACHD185	ACHD186	ACHD187	ACHD188	ACHD189	ACHD190	ACHD191	ACHD192	ACHD193	ACHD194	ACHD195	ACHD196	ACHD197	ACHD198	ACHD199	ACHD200	ACHD201	ACHD202	ACHD203	ACHD204	ACHD205	ACHD206	ACHD207	ACHD208	ACHD209	ACHD210	ACHD211	ACHD212	ACHD213	ACHD214	ACHD215	ACHD216	ACHD217	ACHD218	ACHD219	ACHD220	ACHD221	ACHD222	ACHD223	ACHD224	ACHD225	ACHD226	ACHD227	ACHD228	ACHD229	ACHD230	ACHD231	ACHD232	ACHD233	ACHD234	ACHD235	ACHD236	ACHD237	ACHD238	ACHD239	ACHD240	ACHD241	ACHD242	ACHD243	ACHD244	ACHD245	ACHD246	ACHD247	ACHD248	ACHD249	ACHD250	ACHD251	ACHD252	ACHD253	ACHD254	ACHD255	ACHD256	ACHD257	ACHD258	ACHD259	ACHD260	ACHD261	ACHD262	ACHD263	ACHD264	ACHD265	ACHD266	ACHD267	ACHD268	ACHD269	ACHD270	ACHD271	ACHD272	ACHD273	ACHD274	ACHD275	ACHD276	ACHD277	ACHD278	ACHD279	ACHD280	ACHD281	ACHD282	ACHD283	ACHD284	ACHD285	ACHD286	ACHD287	ACHD288	ACHD289	ACHD290	ACHD291	ACHD292	ACHD293	ACHD294	ACHD295	ACHD296	ACHD297	ACHD298	ACHD299	ACHD300	ACHD301	ACHD302	ACHD303	ACHD304	ACHD305	ACHD306	ACHD307	ACHD308	ACHD309	ACHD310	ACHD311	ACHD312	ACHD313	ACHD314	ACHD315	ACHD316	ACHD317	ACHD318	ACHD319	ACHD320	ACHD321	ACHD322	ACHD323	ACHD324	ACHD325	ACHD326	ACHD327	ACHD328	ACHD329	ACHD330	ACHD331	ACHD332	ACHD333	ACHD334	ACHD335	ACHD336	ACHD337	ACHD338	ACHD339	ACHD340	ACHD341	ACHD342	ACHD343	ACHD344	ACHD345	ACHD346	ACHD347	ACHD348	ACHD349	ACHD350	ACHD351	ACHD352	ACHD353	ACHD354	ACHD355	ACHD356	ACHD357	ACHD358	ACHD359	ACHD360	ACHD361	ACHD362	ACHD363	ACHD364	ACHD365	ACHD366	ACHD367	ACHD368	ACHD369	ACHD370	ACHD371	ACHD372	ACHD373	ACHD374	ACHD375	ACHD376	ACHD377	ACHD378	ACHD379	ACHD380	ACHD381	ACHD382	ACHD383	ACHD384	ACHD385	ACHD386	ACHD387	ACHD388	ACHD389	ACHD390	ACHD391	ACHD392	ACHD393	ACHD394	ACHD395	ACHD396	ACHD397	ACHD398	ACHD399	ACHD400	ACHD401	ACHD402	ACHD403	ACHD404	ACHD405	ACHD406	ACHD407	ACHD408	ACHD409	ACHD410	ACHD411	ACHD412	ACHD413	ACHD414	ACHD415	ACHD416	ACHD417	ACHD418	ACHD419	ACHD420	ACHD421	ACHD422	ACHD423	ACHD424	ACHD425	ACHD426	ACHD427	ACHD428	ACHD429	ACHD430	ACHD431	ACHD432	ACHD433	ACHD434	ACHD435	ACHD436	ACHD437	ACHD438	ACHD439	ACHD440	ACHD441	ACHD442	ACHD443	ACHD444	ACHD445	ACHD446	ACHD447	ACHD448	ACHD449	ACHD450	ACHD451	ACHD452	ACHD453	ACHD454	ACHD455	ACHD456	ACHD457	ACHD458	ACHD459	ACHD460	ACHD461	ACHD462	ACHD463	ACHD464	ACHD465	ACHD466	ACHD467	ACHD468	ACHD469	ACHD470	ACHD471	ACHD472	ACHD473	ACHD474	ACHD475	ACHD476	ACHD477	ACHD478	ACHD479	ACHD480	ACHD481	ACHD482	ACHD483	ACHD484	ACHD485	ACHD486	ACHD487	ACHD488	ACHD489	ACHD490	ACHD491	ACHD492	ACHD493	ACHD494	ACHD495	ACHD496	ACHD497	ACHD498	ACHD499	ACHD500	ACHD501	ACHD502	ACHD503	ACHD504	ACHD505	ACHD506	ACHD507	ACHD508	ACHD509	ACHD510	ACHD511	ACHD512	ACHD513	ACHD514	ACHD515	ACHD516	ACHD517	ACHD518	ACHD519	ACHD520	ACHD521	ACHD522	ACHD523	ACHD524	ACHD525	ACHD526	ACHD527	ACHD528	ACHD529	ACHD530	ACHD531	ACHD532	ACHD533	ACHD534	ACHD535	ACHD536	ACHD537	ACHD538	ACHD539	ACHD540	ACHD541	ACHD542	ACHD543	ACHD544	ACHD545	ACHD546	ACHD547	ACHD548	ACHD549	ACHD550	ACHD551	ACHD552	ACHD553	ACHD554	ACHD555	ACHD556	ACHD557	ACHD558	ACHD559	ACHD560	ACHD561	ACHD562	ACHD563	ACHD564	ACHD565	ACHD566	ACHD567	ACHD568	ACHD569	ACHD570	ACHD571	ACHD572	ACHD573	ACHD574	ACHD575	ACHD576	ACHD577	ACHD578	ACHD579	ACHD580	ACHD581	ACHD582	ACHD583	ACHD584	ACHD585	ACHD586	ACHD587	ACHD588	ACHD589	ACHD590	ACHD591	ACHD592	ACHD593	ACHD594	ACHD595	ACHD596	ACHD597	ACHD598	ACHD599	ACHD600	ACHD601	ACHD602	ACHD603	ACHD604	ACHD605	ACHD606	ACHD607	ACHD608	ACHD609	ACHD610	ACHD611	ACHD612	ACHD613	ACHD614	ACHD615	ACHD616	ACHD617	ACHD618	ACHD619	ACHD620	ACHD621	ACHD622	ACHD623	ACHD624	ACHD625	ACHD626	ACHD627	ACHD628	ACHD629	ACHD630	ACHD631	ACHD632	ACHD633	ACHD634	ACHD635	ACHD636	ACHD637	ACHD638	ACHD639	ACHD640	ACHD641	ACHD642	ACHD643	ACHD644	ACHD645	ACHD646	ACHD647	ACHD648	ACHD649	ACHD650	ACHD651	ACHD652	ACHD653	ACHD654	ACHD655	ACHD656	ACHD657	ACHD658	ACHD659	ACHD660	ACHD661	ACHD662	ACHD663	ACHD664	ACHD665	ACHD666	ACHD667	ACHD668	ACHD669	ACHD670	ACHD671	ACHD672	ACHD673	ACHD674	ACHD675	ACHD676	ACHD677	ACHD678	ACHD679	ACHD680	ACHD681	ACHD682	ACHD683	ACHD684	ACHD685	ACHD686	ACHD687	ACHD688	ACHD689	ACHD690	ACHD691	ACHD692	ACHD693	ACHD694	ACHD695	ACHD696	ACHD697	ACHD698	ACHD699	ACHD700	ACHD701	ACHD702	ACHD703	ACHD704	ACHD705	ACHD706	ACHD707	ACHD708	ACHD709	ACHD710	ACHD711	ACHD712	ACHD713	ACHD714	ACHD715	ACHD716	ACHD717	ACHD718	ACHD719	ACHD720	ACHD721	ACHD722	ACHD723	ACHD724	ACHD725	ACHD726	ACHD727	ACHD728	ACHD729	ACHD730	ACHD731	ACHD732	ACHD733	ACHD734	ACHD735	ACHD736	ACHD737	ACHD738	ACHD739	ACHD740	ACHD741	ACHD742	ACHD743	ACHD744	ACHD745	ACHD746	ACHD747	ACHD748	ACHD749	ACHD750	ACHD751	ACHD752	ACHD753	ACHD754	ACHD755	ACHD756	ACHD757	ACHD758	ACHD759	ACHD760	ACHD761	ACHD762	ACHD763	ACHD764	ACHD765	ACHD766	ACHD767	ACHD768	ACHD769	ACHD770	ACHD771	ACHD772	ACHD773	ACHD774	ACHD775	ACHD776	ACHD777	ACHD778	ACHD779	ACHD780	ACHD781	ACHD782	ACHD783	ACHD784	ACHD785	ACHD786	ACHD787	ACHD788	ACHD789	ACHD790	ACHD791	ACHD792	ACHD793	ACHD794	ACHD795	ACHD796	ACHD797	ACHD798	ACHD799	ACHD800	ACHD801	ACHD802	ACHD803	ACHD804	ACHD805	ACHD806	ACHD807	ACHD808	ACHD809	ACHD810	ACHD811	ACHD812	ACHD813	ACHD814	ACHD815	ACHD816	ACHD817	ACHD818	ACHD819	ACHD820	ACHD821	ACHD822	ACHD823	ACHD824	ACHD825	ACHD826	ACHD827	ACHD828	ACHD829	ACHD830	ACHD831	ACHD832	ACHD833	ACHD834	ACHD835	ACHD836	ACHD837	ACHD838	ACHD839	ACHD840	ACHD841	ACHD842	ACHD843	ACHD844	ACHD845	ACHD846	ACHD847	ACHD848	ACHD849	ACHD850	ACHD851	ACHD852	ACHD853	ACHD854	ACHD855	ACHD856	ACHD857	ACHD858	ACHD859	ACHD860	ACHD861	ACHD862	ACHD863	ACHD864	ACHD865	ACHD866	ACHD867	ACHD868	ACHD869	ACHD870	ACHD871	ACHD872	ACHD873	ACHD874	ACHD875	ACHD876	ACHD877	ACHD878	ACHD879	ACHD880	ACHD881	ACHD882	ACHD883	ACHD884	ACHD885	ACHD886	ACHD887	ACHD888	ACHD889	ACHD890	ACHD891	ACHD892	ACHD893	ACHD894	ACHD895	ACHD896	ACHD897	ACHD898	ACHD899	ACHD900	ACHD901	ACHD902	ACHD903	ACHD904	ACHD905	ACHD906	ACHD907	ACHD908	ACHD909	ACHD910	ACHD911	ACHD912	ACHD913	ACHD914	ACHD915	ACHD916	ACHD917	ACHD918	ACHD919	ACHD920	ACHD921	ACHD922	ACHD923	ACHD924	ACHD925	ACHD926	ACHD927	ACHD928	ACHD929	ACHD930	ACHD931	ACHD932	ACHD933	ACHD934	ACHD935	ACHD936	ACHD937	ACHD938	ACHD939	ACHD940	ACHD941	ACHD942	ACHD943	ACHD944	ACHD945	ACHD946	ACHD947	ACHD948	ACHD949	ACHD950	ACHD951	ACHD952	ACHD953	ACHD954	ACHD955	ACHD956	ACHD957	ACHD958	ACHD959	ACHD960	ACHD961	ACHD962	ACHD963	ACHD964	ACHD965	ACHD966	ACHD967	ACHD968	ACHD969	ACHD970	ACHD971	ACHD972	ACHD973	ACHD974	ACHD975	ACHD976	ACHD977	ACHD978	ACHD979	ACHD980	ACHD981	ACHD982	ACHD983	ACHD984	ACHD985	ACHD986	ACHD987	ACHD988	ACHD989	ACHD990	ACHD991	ACHD992	ACHD993	ACHD994	ACHD995	ACHD996	ACHD997	ACHD998	ACHD999	ACHD1000

EXECUTIVE NARRATIVE

SDG No: **MC49177** Laboratory: **Accutest, Massachusetts**
Analysis: **MADEP VPH** Number of Samples: **16**
Location: **BMSMC, Building 5 Area**
Humacao, PR

SUMMARY: Sixteen (16) samples were analyzed for Volatiles TPHC Ranges by method MADEP VPH. Samples were validated following the METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings:

1. Continuing and final calibration verification meets method specific requirements except in the cases described in this document. The % difference for VPH in the rt5.5/7 retention time window in the continuing and ending calibration verification was outside the method performance criteria. Results are qualified as estimated in affected samples.
2. Target analytes detected in the method and field/equipment blanks. Laboratory qualified positive results below the reporting limit with a B qualifier, no additional qualification performed.
3. MS/MSD % recovery within the laboratory control limits except for the cases described in the Data Review Worksheet. No action taken, recovery criteria apply to the unspiked sample. Unspiked sample from another job.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: **Rafael Infante**
Chemist License 1888

Signature:



Date: **January 21, 2017**

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC49177-1

Sample location: BMSMC Building 5 Area

Sampling date: 12/13/2016

Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	161	ug/L	1	-	J	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	85000	ug/L	100	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	151	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	85.5	ug/L	1	-	J	Yes ✓
Ç9 - C12 Aliphatics	17800	ug/L	1	-	-	Yes

Sample ID: MC49177-2

Sample location: BMSMC Building 5 Area

Sampling date: 12/14/2016

Matrix: AQ - Equipment Blank

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	10.1	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	14.5	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-3
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	12.8	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	14.8	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-4
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: AQ -Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	9.2	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	12.8	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-5
Sample location: BMSMC Building 5 Area
Sampling date: 12/15/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	42.9	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	59.5	ug/L	1	B	B	Yes
Ç9 - C10 Aromatics (Unadj.)	29.7	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	31.4	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	27.3	ug/L	1	J	J	Yes

Sample ID: MC49177-6
Sample location: BMSMC Building 5 Area
Sampling date: 12/15/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	15.8	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	14.4	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	13.9	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	15.3	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-7
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	23.6	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	17.9	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	13.1	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	14.5	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-8
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	11.1	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	16.2	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	16.0	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-9
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50.2	ug/L	1	-	J	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	13.8	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	15.2	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	45.5	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-10
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	10.4	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	13.4	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-11
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	12.1	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	18.4	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	18.5	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	11.5	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-12
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: AQ - Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	9.7	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	11.6	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-13
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	10	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	14.2	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-14
Sample location: BMSMC Building 5 Area
Sampling date: 12/15/2016
Matrix: AQ - Equipment Blank

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	10.4	ug/L	1	JB	JB	Yes
Ç9 - C10 Aromatics (Unadj.)	11.2	ug/L	1	JB	JB	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes ✓
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49177-3MS
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	355	ug/L	1	-	J	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	457	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	137	ug/L	1	-	-	Yes

Sample ID: MC49177-3MSD
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	350	ug/L	1	-	J	Yes ✓
Ç9 - C12 Aliphatics (Unadj.)	455	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	133	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation Full: X Project Number: MC49177
 Limited: _____ Date: 12/13-15/2016
 Shipping date: 12/15/2016
 EPA Region: 2

REVIEW OF VOLATILE PETROLEUM HYDROCARBON (VPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) Accutest Laboratories data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: MC49177 Sample matrix: Groundwater
 No. of Samples: 16
 Field blank No.: MC49177-4; MC49177-12
 Equipment blank No.: MC49177-2; MC49177-14
 Trip blank No.: _____
 Field duplicate No.: MC49177-8/MC49177-9

<u>X</u> Data Completeness	<u>X</u> Laboratory Control Spikes
<u>X</u> Holding Times	<u>X</u> Field Duplicates
<u>N/A</u> GC/MS Tuning	<u>X</u> Calibrations
<u>N/A</u> Internal Standard Performance	<u>X</u> Compound Identifications
<u>X</u> Blanks	<u>X</u> Compound Quantitation
<u>X</u> Surrogate Recoveries	<u>X</u> Quantitation Limits
<u>X</u> Matrix Spike/Matrix Spike Duplicate	

Overall _____ Comments: _____
_Volatiles_by_GC_by_Method_MADEP_VPH,_REV_1.1.

Definition of Qualifiers:

J- Estimated results
 U- Compound not detected
 R- Rejected data
 UJ- Estimated nondetect

Reviewer: Rafael Delant
 Date: January 20, 2017

DATA REVIEW WORKSHEETS

All criteria were met x
Criteria were not met and/or see below

I. DATA COMPLETNESS

A. Data Package:

MISSING INFORMATION

DATE LAB. CONTACTED

DATE RECEIVED

[illegible]

B. Other

Discrepancies:

[illegible]

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples analyzed within method recommended holding time. Sample preservation within the required criteria.				

Criteria

Preservation:

Samples analyzed with ambient purge temperature: Samples must be acidified to a pH of 2.0 or less at the time of collection.

Samples analyzed with heated purge temperature: Samples must be treated to a pH of 11.0 or greater at the time of collection.

Methanol preservation of soil/sediment samples is mandatory. Methanol (purge-and-trap grade) must be added to the sample vial before or immediately after sample collection. In lieu of the in-field preservation of samples with methanol, soil samples may be obtained in specially-designed air tight sampling devices, provided that the samples are extruded and preserved in methanol within 48 hours of collection.

Holding times:

Aqueous samples using ambient or heated purge - analyze within 14 days.

Soil/sediment samples - analysis within 28 days.

Cooler temperature (Criteria: 4 ± 2 °C): 3.8°C

Actions: Qualify positive results/non-detects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature ($> 10^{\circ}\text{C}$) or improperly preserved, use professional judgment to qualify the results.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: 10/31/16

Dates of initial calibration verification: 10/31/16

Instrument ID numbers: GCWX

Matrix/Level: AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and initial calibration verification meet method specific requirements				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C5-C8 Aliphatic Hydrocarbons and C9-C12 Aliphatic Hydrocarbons using the FID chromatogram. Calculate the collective CF for the C9-C10 Aromatic Hydrocarbons using the PID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples, and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than $\pm 25\%$, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and

DATA REVIEW WORKSHEET

- percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: _____10/31/16_____

Dates of continuing calibration verification: __12/20/16;_12/21/16__

Dates of final calibration verification: _10/31/16;_12/20/16;_12/21/16_

Instrument ID numbers: _____GCWX_____

Matrix/Level: _____AQUEOUS/MEDIUM_____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
12/20/16	cc3857-50	rt5.5/7	27.4 %	MC49177-1; -3; -3MS/-3MSD; -5 to - 11; -13; -2; -4
			26.5 %	
12/21/16	cc3857-50	rt5.5/7	31.2 %	MC49177-12; -14;
			28.3 %	

Note: Continuing and final calibration verification meets method specific requirements except in the cases described in this document. The % difference for VPH in the rt5.5/7 retention time window in the continuing and ending calibration verification outside the method performance criteria. Results are qualified as estimated in affected samples.

A separate worksheet should be filled for each initial curve

DATA REVIEW WORKSHEETS

All criteria were met _____
 Criteria were not met and/or see below X

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
<u> METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA EXCEPT IN THE CASES DESCRIBED IN THIS DOCUMENT. </u>				
<u> 12/20/16 </u>	<u> GWX3883-MB </u>	<u> Aqueous/low </u>	<u> C9-C12_Aliphatics_(Unadj.) </u>	<u> 10.5_ug/L </u>
			<u> C9-C10_Aromatics_(Unadj.) </u>	<u> 14.4_ug/L </u>
<u> 12/21/16 </u>	<u> GWX3884-MB </u>	<u> Aqueous/low </u>	<u> C9-C12_Aliphatics_(Unadj.) </u>	<u> 11.4_ug/L </u>
			<u> C9-C10_Aromatics_(Unadj.) </u>	<u> 12.2_ug/L </u>

Note: Laboratory qualified positive results below the reporting limit with a B qualifier, no additional qualification performed.

Field/Trip/Equipment

A methanol trip blank or acidified reagent water trip blank **should** continually accompany each soil/sediment sample or water sample batch, respectively, during sampling, storage, and analysis.

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
<u> NO TRIP BLANK ASSOCIATED WITH THIS DATA PACKAGE. </u>				
<u> ANALYTES DETECTED IN FIELD/EQUIPMENT BLANKS ANALYZED AT A CONCENTRATION BELOW THE REPORTING LIMITS EXCEPT FOR THE CASES DESCRIBED IN HIS DOCUMENT. </u>				
<u> 12/20/16 </u>	<u> MC49177-2 </u>	<u> Aqueous/low </u>	<u> C5-C8_Aliphatics_(Unadj.) </u>	<u> 10.1_ug/L </u>
			<u> C9-C12_Aliphatics_(Unadj.) </u>	<u> 14.5_ug/L </u>

DATA REVIEW WORKSHEETS

DATE ANALYZED	LAB ID	LEVEL/MATRIX	COMPOUND	CONCENTRATION UNITS
12/20/16	MC49177-4	Aqueous/low	C9-C12_Aliphatics_(Unadj.)	9.2_ug/L_
			C9-C10_Aromatics_(Unadj.)	12.8_ug/L_
12/21/16	MC49177-12	Aqueous/low	C9-C12_Aliphatics_(Unadj.)	9.7_ug/L_
			C9-C10_Aromatics_(Unadj.)	11.6_ug/L_
12/21/16	MC49177-14	Aqueous/low	C9-C12_Aliphatics_(Unadj.)	10.4_ug/L_
			C9-C10_Aromatics_(Unadj.)	12.8_ug/L_

Note: No action taken, analytes not detected in samples above the reporting limit.

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.

Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND	ACTION
	2,3,4-Trifluorotoluene	

 SURROGATE_STANDARD_RECOVERIES_WITHIN_LABORATORY_CONTROL
 LIMITS

QC Limits* (Aqueous)

 LL_to_UL 70_to_130 to to

QC Limits* (Solid)

 LL_to_UL to to to

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 70% or more than 130%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) Percent moisture of associated soil/sediment sample is >25% and surrogate recovery is >10%; or
- (3) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 70 - 130% of the true value. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range), but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID: MC49177-3_MS/MSD Matrix/Level: Groundwater

List the %Rs, RPD of the compounds which do not meet the QC criteria.

Note: MS/MSD % recovery and RPD within laboratory control limits.

DATA REVIEW WORKSHEETS

Sample ID: MC49195-2_MS/MSD

Matrix/Level: Groundwater

The QC reported here applies to the following samples:
MC49177-12, MC49177-14

Method: **MADEP VPH REV 1.1**

Compound	MC49195-2 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
C9-C10										
Aromatics (Unadj.)	15.4		150	116	67* a	150	117	68* a	1	70-130/25

(a) Outside control limits due to possible matrix interference.

* = Outside of Control Limits.

Note: MS/MSD % recovery outside the laboratory control limits. No action taken, recovery criteria apply to the unspiked sample. Unspiked sample from another job.

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION			%RPD	ACTION
	SAMPLE	MS	MSD		

Criteria: None specified, use %RSD \leq 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J).

If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION
<u> LCS_RECOVERY_WITHIN_LABORATORY_CONTROL_LIMITS </u>				

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 70% and 130%. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range). If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R criteria and the magnitude of the exceedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: MC49177-8/MC49177-9

Matrix: Groundwater

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
Field duplicate analyzed with this data package. RPD within laboratory and validation guidance document criteria ($\pm 50\%$) for analytes detected above reporting limits.					

Criteria:

The project QAPP should be reviewed for project-specific information.
RPD $\pm 30\%$ for aqueous samples, RPD $\pm 50\%$ for solid samples if results are \geq SQL.
If both samples and duplicate are <5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is $< 5x$ the SQL, use professional judgment to determine if qualification is appropriate.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target VPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - Coelution of the m- and p- xylene isomers is permissible.
 - All surrogates must be adequately resolved from individual Target Analytes included in the VPH Component Standard.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

Note: Target analytes were within the retention time window.

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

1. In the space below, please show a minimum of one sample calculation:

MC49177-1 VPH (C9 – C12 Aliphatics) RF = 2.125×10^4

FID

$$[] = (3343631) / (2.125 \times 10^4)$$

$$[] = 157.3 \text{ ppb} \quad \text{Ok}$$

MC49177-1 VPH (C9 – C10 Aromatics) RF = 7.865×10^3

PID

$$[] = (1187738) / (7.865 \times 10^3)$$

$$[] = 151.0 \text{ ppb} \quad \text{Ok}$$

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).

3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION
MC49177-1	100 x	C9 – C12 aliphatics over the calibration range.

If dilution was not performed and the results were above the concentration range, estimate results (J) for the affected compounds. List the affected samples/compounds:

EXECUTIVE NARRATIVE

SDG No: **MC49177** Laboratory: **Accutest, Massachusetts**
Analysis: **MADEP EPH** Number of Samples: **16**
Location: **BMSMC, Building 5 Area**
Humacao, PR

SUMMARY: Sixteen (16) samples were analyzed for Extractable TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings:

1. Continuing and final calibration verification meets method specific requirements except in the cases described in this document. The % difference for EPH in the C11-C22 (Aromatics) retention time window in the continuing and ending calibration verification was outside the method performance criteria. Results are qualified as estimated in affected samples.
2. 1-chlorooctadecane recovered outside the laboratory control limits in samples MC49177-1 to -9; and -12. Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis. No action taken.
3. C9-C18 aliphatics LCS/LCS % recovery RPD outside laboratory control limits. Recovery of n-nonane was <30% for the laboratory control simple. No action taken, professional judgment.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: **Rafael Infante**
Chemist License 1888

Signature:



Date: **January 21, 2017**

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC49177-1
 Sample location: BMSMC Building 5 Area
 Sampling date: 12/13/2016
 Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	49.8	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	71.8	ug/L	1	J	J	Yes
Ç11 - C22 Aromatics	48.8	ug/L	1	J	J	Yes

Sample ID: MC49177-2
 Sample location: BMSMC Building 5 Area
 Sampling date: 12/14/2016
 Matrix: AQ - Equipment Blank

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	UJ	Yes ✓ /
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	UJ	Yes ✓ /

Sample ID: MC49177-3
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	41.1	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	40.4	ug/L	1	J	J	Yes

Sample ID: MC49177-4
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: AQ -Field Blank Water
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	UJ	Yes ✓
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	UJ	Yes ✓

Sample ID: MC49177-5
Sample location: BMSMC Building 5 Area
Sampling date: 12/15/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	80.6	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	77.7	ug/L	1	J	J	Yes

Sample ID: MC49177-6
Sample location: BMSMC Building 5 Area
Sampling date: 12/15/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	57.3	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	31.3	ug/L	1	J	J	Yes
Ç11 - C22 Aromatics	57.3	ug/L	1	J	J	Yes

Sample ID: MC49177-7
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	98.2	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	63.5	ug/L	1	J	J	Yes

Sample ID: MC49177-8
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	36.6	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	35.6	ug/L	1	J	J	Yes

Sample ID: MC49177-9
Sample location: BMSMC Building 5 Area
Sampling date: 12/13/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	38.7	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	37.7	ug/L	1	J	J	Yes

Sample ID: MC49177-10
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	39.3	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	38.9	ug/L	1	J	J	Yes

Sample ID: MC49177-11
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	72.5	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	71.1	ug/L	1	J	J	Yes

Sample ID: MC49177-12
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: AQ - Field Blank Water
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	UJ ✓	Yes ✓
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1	-	UJ	Yes ✓

Sample ID: MC49177-13
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	48.7	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	48.0	ug/L	1	J	UJ	Yes

Sample ID: MC49177-14
Sample location: BMSMC Building 5 Area
Sampling date: 12/15/2016
Matrix: AQ - Equipment Blank
METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	UJ	Yes ✓
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1	-	UJ	Yes ✓

Sample ID: MC49177-3MS
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	870	ug/L	1	-	J	Yes ✓
Ç9 - C18 Aliphatics	326	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	435	ug/L	1	-	-	Yes

Sample ID: MC49177-3MSD
Sample location: BMSMC Building 5 Area
Sampling date: 12/14/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	726	ug/L	1	-	J	Yes ✓
Ç9 - C18 Aliphatics	188	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	375	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation Full: ☒ Limited: ☐ Project Number: MC49177 Date: 12/13-15/2016 Shipping date: 12/15/2016 EPA Region: 2

REVIEW OF EXTRACTABLE PETROLEUM HYDROCARBON (EPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (VPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) Accutest Laboratories data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: MC49177 Sample matrix: Groundwater
No. of Samples: 16
Field blank No.: MC49177-4; MC49177-12
Equipment blank No.: MC49177-2; MC49177-14
Trip blank No.: -
Field duplicate No.: MC49177-8/MC49177-9

<input checked="" type="checkbox"/> Data Completeness	<input checked="" type="checkbox"/> Laboratory Control Spikes
<input checked="" type="checkbox"/> Holding Times	<input checked="" type="checkbox"/> Field Duplicates
<input type="checkbox"/> GC/MS Tuning	<input checked="" type="checkbox"/> Calibrations
<input type="checkbox"/> Internal Standard Performance	<input checked="" type="checkbox"/> Compound Identifications
<input checked="" type="checkbox"/> Blanks	<input checked="" type="checkbox"/> Compound Quantitation
<input checked="" type="checkbox"/> Surrogate Recoveries	<input checked="" type="checkbox"/> Quantitation Limits
<input checked="" type="checkbox"/> Matrix Spike/Matrix Spike Duplicate	

Overall Comments:
Extractable_Petroleum_Hydrocarbons_by_GC_by_Method_MADEP_EPH_REV_1.1.

Definition of Qualifiers:

J- Estimated results
U- Compound not detected
R- Rejected data
UJ- Estimated nondetect

Reviewer: Rafael Defaut
Date: January 20, 2017

DATA REVIEW WORKSHEETS

All criteria were met x
Criteria were not met and/or see below

I. DATA COMPLETNESS

A. Data Package:

MISSING INFORMATION

DATE LAB. CONTACTED

DATE RECEIVED

B. Other

Discrepancies:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples extracted and analyzed within method recommended holding time				

Criteria

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.

Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature (Criteria: 4 ± 2 °C): 3.9°C

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and reject nondetects (R).

If samples were not at the proper temperature ($> 10^{\circ}\text{C}$) or improperly preserved, use professional judgment to qualify the results.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: 12/06/16

Dates of initial calibration verification: 12/06/16

Instrument ID numbers: GCDE

Matrix/Level: AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and continuing calibration meet method specific requirements				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
 - The area for the surrogates must be subtracted from the area summation of the range in which they elute.
 - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and

DATA REVIEW WORKSHEETS

at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.

- If the percent difference (%D) for any analyte varies from the predicted response by more than $\pm 25\%$, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:_____12/06/16_____

Dates of continuing calibration verification:___12/28/16;_12/29/16;_01/03/17_____

Dates of final calibration verification:___12/06/16;_12/29/16;_12/29/16;_01/03/17___

Instrument ID numbers:_____GCDE_____

Matrix/Level: _SOIL/AQUEOUS/MEDIUM_____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, <u>%D</u> , r	SAMPLES AFFECTED
Initial and continuing calibration meets method specific requirements except for the cases described in this document.				
12/29/16	ecc908-50	C11-C22 Aromatics	99.1	QC samples
12/29/16	cc908-50	C11-C22 Aromatics	99.1	MC49177-1 to -10
12/29/16	cc908-50	C11-C22 Aromatics	99.1	MC49177-11 to -14
12/29/16	cc908-50	C11-C22 Aromatics	99.1	MC49177-11 to -14

Note: Results qualified as estimated (J or UJ) in affected samples.

A separate worksheet should be filled for each initial curve

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/MATRIX	COMPOUND	CONCENTRATION UNITS
---------------	--------	--------------	----------	---------------------

 METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA

Field/Trip/Equipment

DATE ANALYZED	LAB ID	LEVEL/MATRIX	COMPOUND	CONCENTRATION UNITS
---------------	--------	--------------	----------	---------------------

 NO TARGET ANALYTES DETECTED IN THE FIELD/EQUIPMENT BLANK

 ANALYZED FOR THIS DATA PACKAGE.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is $<$ sample quantitation limit (SQL) and $<$ AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but $<$ AL, report the compound as not detected (U) at the reported concentration.

If the concentration is $>$ AL, report the concentration unqualified.

All criteria were met X
 Criteria were not met and/or see below

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.

Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND				ACTION
	S1	S2	S3	S4	
<u> SURROGATE STANDARDS RECOVERIES WITHIN LABORATORY CONTROL </u> <u> LIMITS EXCEPT IN THE CASES DESCRIBED IN THIS DOCUMENT. </u>					

Note: 1-chlorooctadecane recovered outside the laboratory control limits in samples MC49177-1 to -9; and -12. Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis. No action taken.

S1 = o-Terphenyl 40-140%

S2 = 2-Fluorobiphenyl 40-140%

S3 = 1-Chlorooctadecane 40-140%

S4 = 2-Bromonaphthalene 40-140%

QC Limits (%)* (Aqueous)

 LL to UL 40 to 140 40 to 140 40 to 140 40 to 140

QC Limits* (Solid)

 LL to UL to to to to

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below _____

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 - 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID: MC49177-3_MS/MSD Matrix/Level: Groundwater

List the %Rs, RPD of the compounds which do not meet the QC criteria.

MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION

Note: MS/MSD and RPD within laboratory control limits.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION		MSD	%RPD	ACTION
	SAMPLE	MS			

Criteria: None specified, use %RSD \leq 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J).

If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

All criteria were met X
Criteria were not met and/or see below

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION
--------	----------	-----	----------	--------

LCS/LCSD_RECOVERY_WITHIN_LABORATORY_CONTROL_LIMITS_EXCET_FOR_
THE_CASES_DESCRIBED_IN_THIS_DOCUMENT.

Note: C9-C18 aliphatics LCS/LCS % recovery RPD outside laboratory control limits. Recovery of n-nonane was <30% for the laboratory control simple. No action taken, professional judgment.

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 40% and 140%. Lower recoveries of n-nonane are permissible. If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative. RPD between LCS/LCSD must be < 25%.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R and RPD criteria and the magnitude of the excedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: MC49177-8/MC49177-9 Matrix: Groundwater

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
Field duplicate analyzed with this data package. RPD within laboratory and generally acceptable control limits					

Criteria:

The project QAPP should be reviewed for project-specific information.
RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL.
If both samples and duplicate are <5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is $< 5x$ the SQL, use professional judgment to determine if qualification is appropriate.

All criteria were met X
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target EPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
 - All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

- 1a. Aliphatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
 - Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

- 1b. Aromatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
 - Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.
3. Breakthrough determination - Each sample (field and QC sample) must be evaluated for potential breakthrough on a sample specific basis by evaluating the % recovery of the fractionation surrogate (2-bromonaphthalene) and on a batch basis by quantifying naphthalene and 2-methylnaphthalene in both the aliphatic and aromatic fractions of the LCS and LCSD. **If either the concentration of naphthalene or 2-methylnaphthalene in the aliphatic fraction exceeds 5% of the total concentration for naphthalene or 2-methylnaphthalene in the LCS or LCSD, fractionation must be repeated on all archived batch extracts.**

NOTE: The total concentration of naphthalene or 2-methylnaphthalene in the LCS/LCSD pair includes the summation of the concentration detected in the aliphatic fraction and the concentration detected in the aromatic fraction.

Comments: Concentration in the aliphatic fraction < 5% of the total
concentration for naphthalene and 2-methylnaphthalene

4. **Fractionation Check Standard** – A fractionation check solution is prepared containing 14 alkanes and 17 PAHs at a nominal concentration of 200 ng/μl of each constituent. The Fractionation Check Solution must be used to evaluate the fractionation efficiency of each new lot of silica gel/cartridges, and establish the optimum hexane volume required to efficiently elute aliphatic hydrocarbons while not allowing significant aromatic hydrocarbon breakthrough. For each analyte contained in the fractionation check solution, excluding n-nonane, the Percent Recovery must be between 40 and 140%. A 30% Recovery is acceptable for n-nonane.

Is a fractionation check standard analyzed?

Yes? or No?

Comments: Not applicable.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample? Yes? or No?

Is aromatic mass discrimination observed in the sample? Yes? or No?

1. In the space below, please show a minimum of one sample calculation:

MC49177-1 EPH (C11 – C22, Aromatics) RF = 99940

[] = (2313350)/(99940)

[] = 23.14 ppb Ok

 EPH (C19 - C36, Aliphatics) RF = 67800

[] = (2264689)/(67800)

[] = 33.40 ppb Ok

DATA REVIEW WORKSHEETS

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).
3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION

If dilution was not performed, estimate results (J) for the affected compounds. List the affected samples/compounds:
